

Lessons Learned: SMART Dispersant Monitoring Exercise (March 22-23rd 2004)

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I. Summary

On March 22-23 2004 Clean Sound Cooperative, Inc. (CSCI), Marine Spill Response Corporation (MSRC), USCG Pacific Area Strike Team, USCG, District 13 District Response Advisory Team, NOAA, and Washington State Department of Ecology participated in a SMART Dispersant Monitoring Protocol exercise.

On March 22 a meeting was held to further plan out the exercise, conduct preliminary calibrations, set up pumping systems, and troubleshoot if necessary. Each of four fluorometers were calibrated to the same batch of fluorescein standard and DI water. A 10 ppm of dispersed oil in water standard was run through the fluorometers to establish the relative response to oil. Consistent instrument readings were assured between instruments under a varied concentration conditions.

The actual monitoring portion of the exercise took place on March 23, 2004 approximately 1.5 miles north of Angeles Pt. in the Strait of Juan De Fuca. Four monitoring teams were placed aboard three operating platforms. Vessels and workboats utilized in the exercise were the Shearwater (CSCI), Arctic Tern (CSCI), Dunlin (CSCI), and the USCG Munson Boat. Prior to departing calibration, air leak tests, and lag time tests were performed on board each vessel.

To simulate dispersed oil monitoring three fluorescein dye releases were conducted. Since fluorescein can be detected and measured using the long wave oil optical kit it is an ideal surrogate for SMART monitoring practices. Data was successfully collected, processed, and reported as concentration vs. time vs. position on Excel and ARCMAP.

All principal objectives were met during this exercise. Each team did a fantastic job of trouble shooting and overcoming technical difficulties as they arose. On the other hand, many of the problems that arose took up valuable time and could be avoided with additional practice. Thus, there is an overall recommendation for additional practice. The group discussed the possibility of adding a third, smaller scale exercise this year. Most agreed it was a good idea.

II. Exercise Objectives:

- Safety
- Build on proficiency use, setup and calibration of the fluorometer
- Build on proficiency of implementing SMART monitoring protocols
- Build on proficiency of sampling teams to receive and implement directives

- Build on proficiency to collect, aggregate, download, and interpret data
- Perform the exercise in an open water environment where it is possible that dispersants might actually be released.

III. Exercise Accomplishments and Recommendations

- A. Safety: No one was injured. Safety instruction and supervision were adequate.
- B. Build on proficiency use, setup and calibration of the fluorometers: Each of the fluorometers setup and calibrated off the same standard. Three of the four fluorometers experienced power supply problems for their pumps:
 - i. The desiccants were checked from each of the fluorometers. All had gone bad and needed to be replaced. According to Environment Canada technicians, expired desiccants will cause readings to drift.
Recommend a dessicant check routinely be added to SMART calibration procedures.
 - ii. To assure consistent calibration between the fluorometers, each was set up and calibrated at the same time. This worked well but worked better last year when the fluorometers were lined up side to side to side. As with last year one of the fluorometers did not have all the elements of the long wave kit and this was not noticed until unstable calibration readings were observed. **Recommend side by side step by step set up and calibration when feasible. During this process a check for appropriate lamps and optic filters must occur.**
 - iii. The calibration process can require significant quantities of standard and DI water. To better assure consistent calibration a large (4 liters) batch of fluorescein standard was created so that each fluorometer could be calibrated and if necessary flushed multiple times during the calibration process. This worked well.
 1. **Instead of creating single liter batches of standard, recommend the creation of larger batches of standard so that consistent calibrations can be assured between fluorometers. This procedure requires a batch of stock standard on hand as well as, 1 and 2 liter volumetric flasks, and 1 gallon amber jars (or foil wrapped). Several gallons of DI water should be on hand.**
 - iv. To roughly equate raw score fluorescein readings with dispersed oil readings, dispersed oil standards were created and run through the fluorometer. The procedure used was similar to that suggested by Environment Canada. A premix standard of 1000 ppm dispersed oil in sea water was created. Increments of this standard were added to 20 liter buckets of seawater pretreated with 1 ml of dispersant. The mix was then recycled through the fluorometers for several minutes and readings obtained. Initially this process did not work well because the return hose was pulling in air bubbles and creating artificially high raw fluorescence scores. The initial misinterpretation was that the fluorometer was unable to distinguish between dispersed oil concentrations of 1 pm and 10 pm. However, when the exhaust hose was discharged into a separate bucket, the fluorometer was readily able to distinguish the varied concentrations, background water RFS = 16, while the 10 ppm dispersed oil standard RFS = 64.
 1. **Recommend, when feasible, calibrate the fluoescsein to a dispersed oil concentration.**
 - a. **This information will be helpful to better understand the effectiveness of a dispersant application. The oil**

- in water standard should be run through the fluorometer via syringe or as per the Environment Canada method.
 - i. Recommend using a series of 20 liter buckets to prevent air bubble interference.
 - 2. Recommend that SMART protocol incorporate an air bubble interference test. Is the concentration reading the same when pumping sea water or standard through the system as it is when the pump is stopped but with a sample remaining in the monitoring chamber?
 - v. A spiked sample test was conducted to measure the lag time between encounter time and monitor time. To do this a very small drop of fluoroscene was mixed into an intake bucket and the time measured until the spike occurred.
 - 1. Recommend a SMART protocol be added to document lag time and thus better enable position vs concentration data can be better understood.
 - 2. Recommend exploring the possibility of using intake hoses with smaller diameters as a means to decrease data recording lag time
 - vi. As with past exercises the speed at which fluorometers might transect was limited to about 1-2 knots. At faster speeds the hose levels raised as dragged aft resulting in inaccurately portrayed depth transects.
 - 1. Recommend exploring possibility of better weights, semi-flexible sampling poles, etc. that might be to control sampling depth
 - 2. Recommend exploring possibility of accessing a pressure transducer to more accurately record depth data.
 - vii. Three of the four fluorometers experienced setup difficulties when out in the field. The principal cause was reliance on gel cels as a power supply for the pumps.
 - 1. Recommend, when feasible, using alternate power supplies. Pumps should never use a battery power supply because they are unreliable and the power supply inconsistent. As the batteries drain the pump rate slows down, thus changing encounter to reading lag time. Two types of alternatives:
 - a. Supply power to the fluorometer pump from the workboat platform
 - i. Recommend fluorometer go kits include:
 - 1. Cigarette lighter adapter for DC power
 - 2. An AC to DC 12 volt power supply that can be plugged into ship power supplies
 - 3. 100 feet of insulated wire/extension cords with various connections to deal with unknown power supplies, wire cutters, electrical tape, alligator clips, etc..
 - b. Bring portable generators that can provide DC power
 - 2. Recommend exploring the possibility of using a submersible fluorometer.
 - viii. Two pieces of valuable equipment were either damaged or lost during the exercise.

1. **Recommend that all equipment be properly tied down and covered to minimize equipment damage.**
 - a. **Bring bungee cord, safety straps, zip ties, tarps, etc..**

C. Build on proficiency of implementing SMART monitoring protocols and implement sampling directives.

- i. During the exercise three dye releases occurred i.e., one continuous release from a geographically stable position and two instantaneous releases from a fixed position.
- ii. Based on the June 2003 exercise it was found that it was better to set up your sampling teams down current from the release site rather than try to chase down the plume. For the initial release the monitoring teams set up for what they presumed was down current during an ebbing tide. Unfortunately upon release the dye and the buoy mark went north. The sampling teams were thus out of position. The smaller more mobile monitoring platforms were able to respond and revise their sampling scheme better than the larger platform. During the third release a larger amount of dye was used and monitoring teams positioned themselves to the south east of a release that went east with the tide. Monitors were thus drifting with the plume and better able to cut transects. The larger dye release enabled the opportunity to make several transect passes prior to the dyes dissipation. There was some discussion regarding whether skimmers were, from a planning perspective, ideal platforms for dispersant monitoring since they likely would be deployed as ORVS.
 1. **Recommend exploring possibility of retaining alternative open water monitoring platforms other than ORVS, e.g., fishing boats, etc..**
 2. **Recommend, when possible, smaller more mobile platforms be used to conduct sampling. This will be possible when based off "Parent Vessels"**
 3. **Recommend that numerous buoys/floats/drogues be dispatched prior to and during the applications so that sampling teams can optimize sampling positioning and better characterize current speed and direction.**
 - a. **Mounting the buoy with a GPS unit was effective**
 - b. **Flow meters might also be deployed to better understand the volume encountered.**
 4. **Recommend running modeling trajectories from the start location to better optimize sampling pre-positioning.**
 5. **Recommend that larger platforms focus on longitudinal (broader) transects that require less agility.**
 6. **Recommend for future exercises that relatively instantaneous releases occur, but that at least two gallons of dye be released.**
- iii. During the June 03 exercise it was found that the fixed point multiple depth vertical transect missed the plume. During this years exercise one of the units attempted to sample from multiple depths but while transecting. This resulted in a far greater success of encountering the plume. As with last years exercise hoses dragged a bit and transect depth became less certain. As a last minute add on to this years exercise it was hoped to be able to conduct a spatial analysis on the sampling data to back calculate the volume of dye released. Due to the pump power supply failure this calculation was not possible.

1. Recommend that at least one fluorometer team be dedicated to characterizing vertical profile while transecting.
 2. Recommend adding depth sensors to the fluorometer intakes so that depth is more accurately characterized.
 3. Consider adding flow meters to the vessels to better understand mass encounter.
- iv. A radio failure occurred during this drill
1. Recommend that backup radios be provided to each platform

D. Build on proficiency to collect, aggregate, download, and interpret data:

- i. During this drill two data dumps occurred an attempt was made to take data and crunch it into relatively real time reports. Concentration vs time and concentration vs. time vs. position. The method of data dumping was to pass along concentration data disks and GPS units to a field boat. The data collection workboat then passed data to a command boat. During the setup process each GPS unit was cleared, times and coordinates cross checked, datums set at WGS 84, and download compatibility with the computer checked. The newer Garmins proved easier to use. The team data aggregation team was successful in rapidly producing several preliminary reports. Performance will improve with additional practice.
 1. Recommend exploring the possibility of automating data aggregation with a combined data logger. The ability to rapidly process data would increase tremendously if position, depth, and concentration data aggregation were automated. The use of data loggers might also decrease the risk to PCs that are easily damaged by water spray and impacts.
 2. Recommend that GPS checks such as clearing, time check between units, datum, battery power, etc. be added to procedures. Fluorometer clock should be set by GPS clocks.
- ii. One of the teams forgot to turn on their internal data recorder.
 1. Recommend this check be verified with a radio check from the command boat. Teams need to be made aware that the internal data logger should be started even if they have a laptop downloading continuously.

Additional Positives

The Crow's nest from the CSCI Shearwater provided an ideal location to observe and coordinate vessels. Utilizing a two day exercise insured that quality was not sacrificed due to time constraints. Keeping the exercise real with a morning calibration check and air leak test added value to the exercise. Ecology's new diaphragm pump worked well (i.e., when it had power). NOAA did a good job of setting up the dye release last year. NOAA's help, as always, is encouraged.







10-AU
Fluorometer

TURN
TO
SEAL
EX

TURNER DESIGNS
Berkeley, California

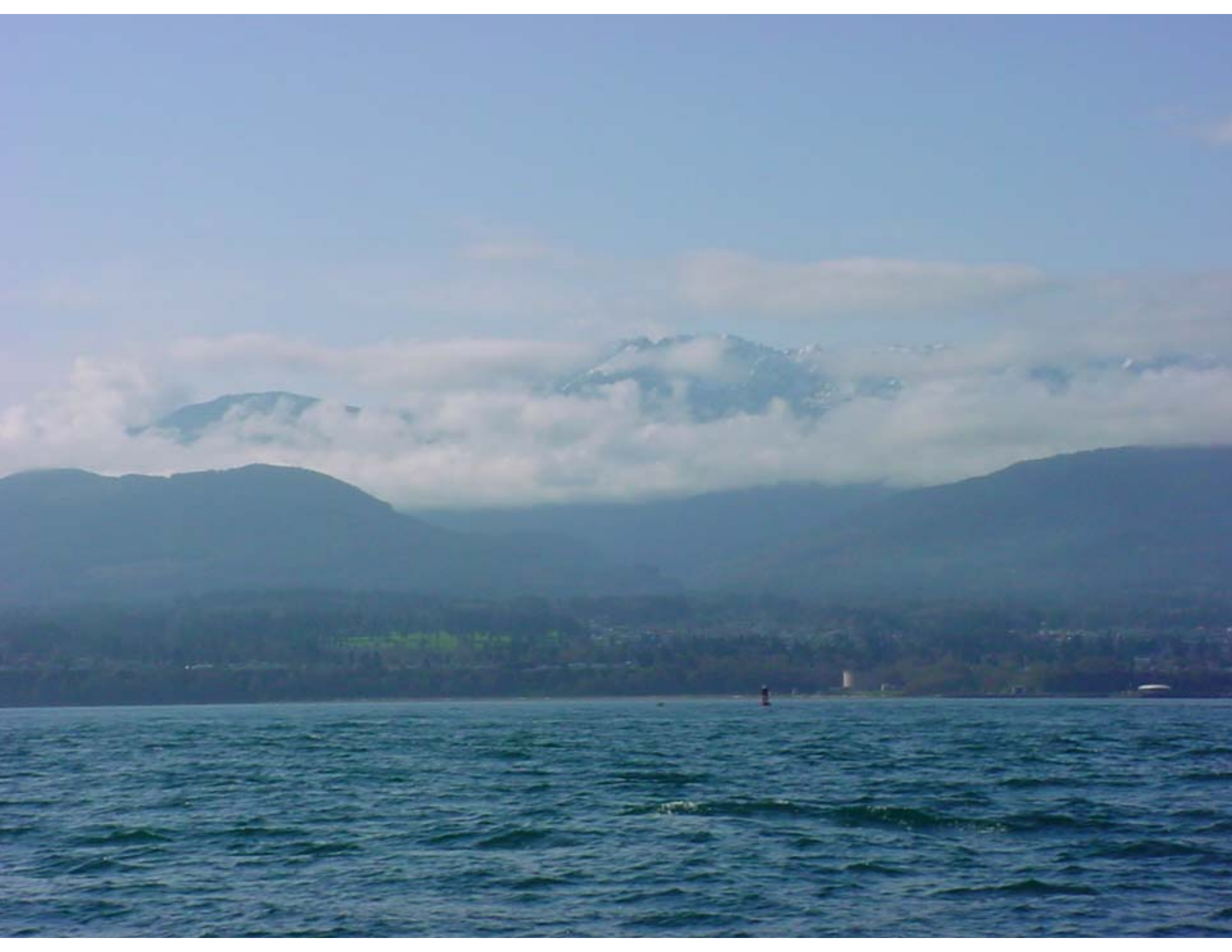
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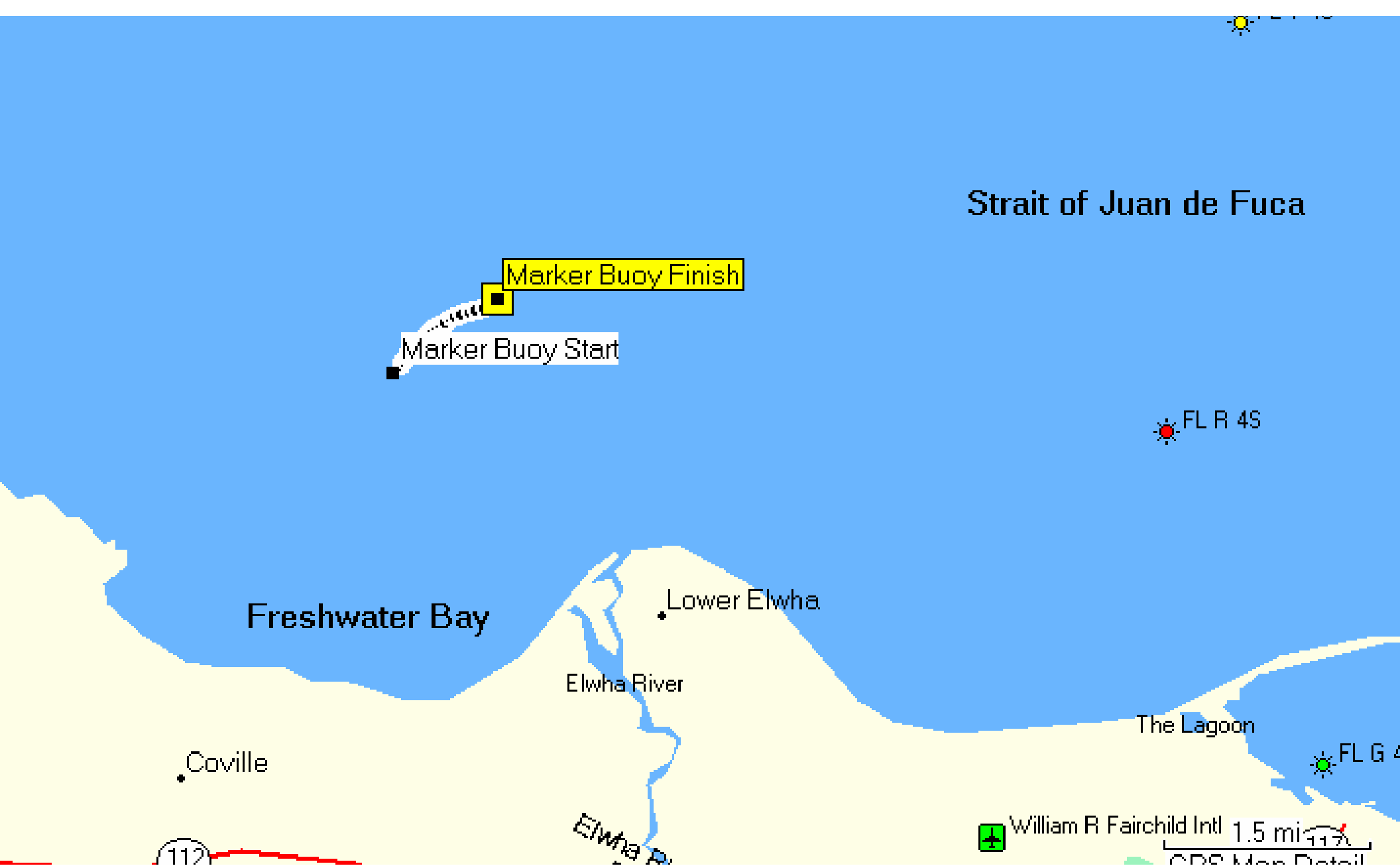


FLUORIMETER I

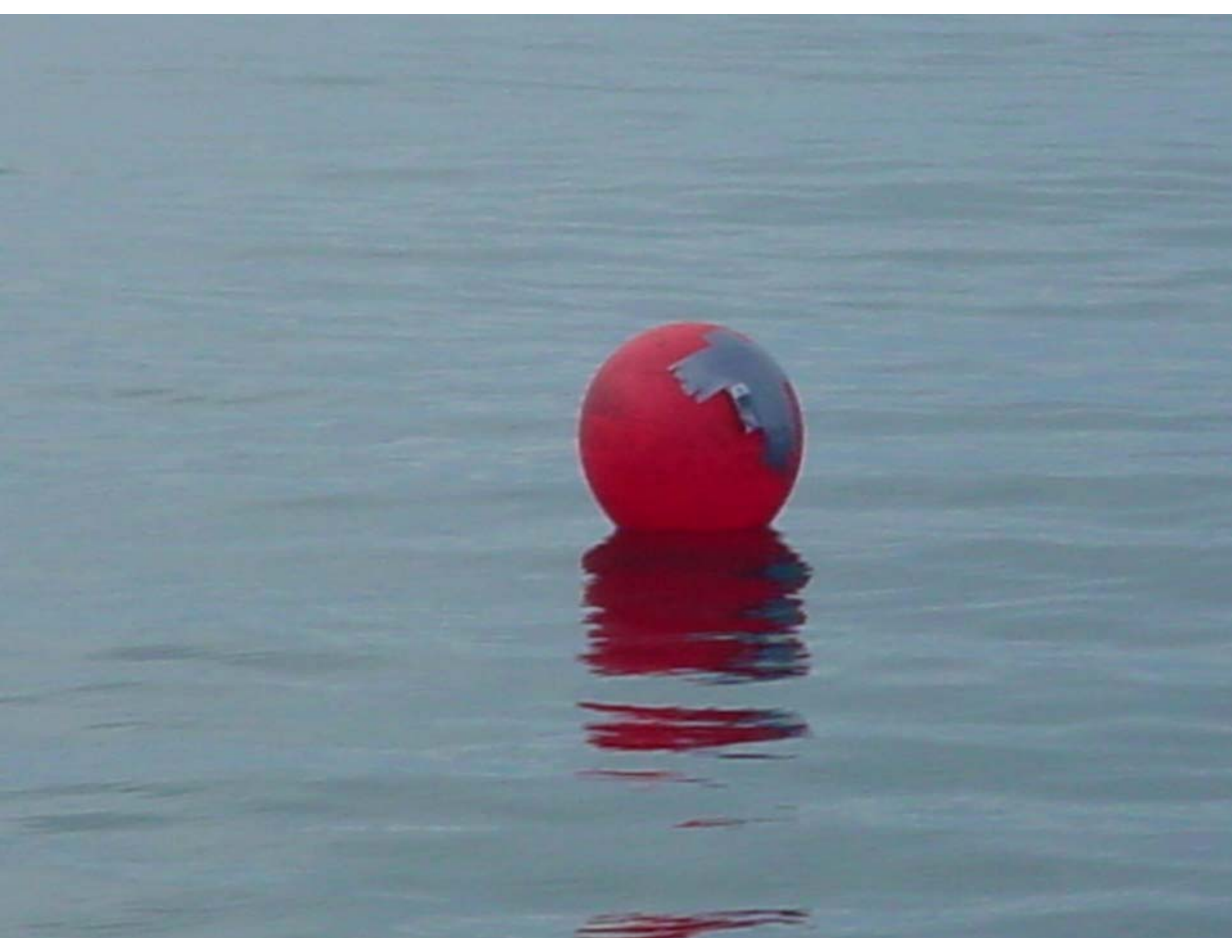
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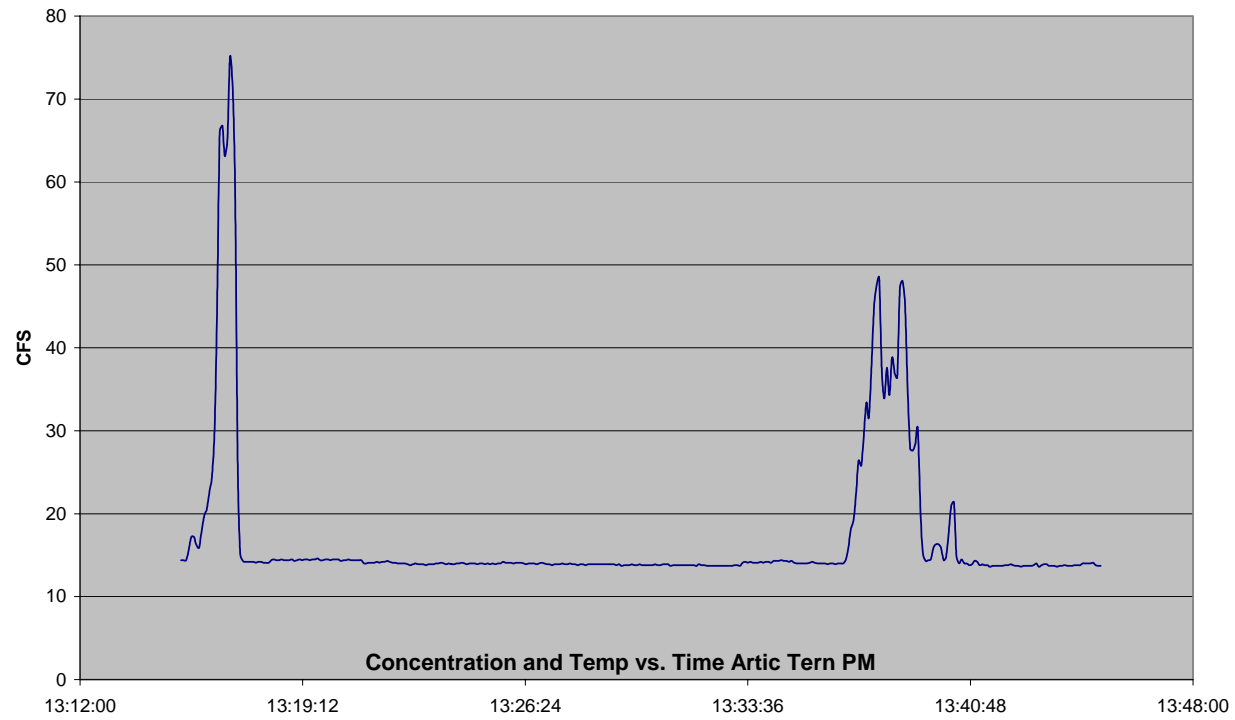




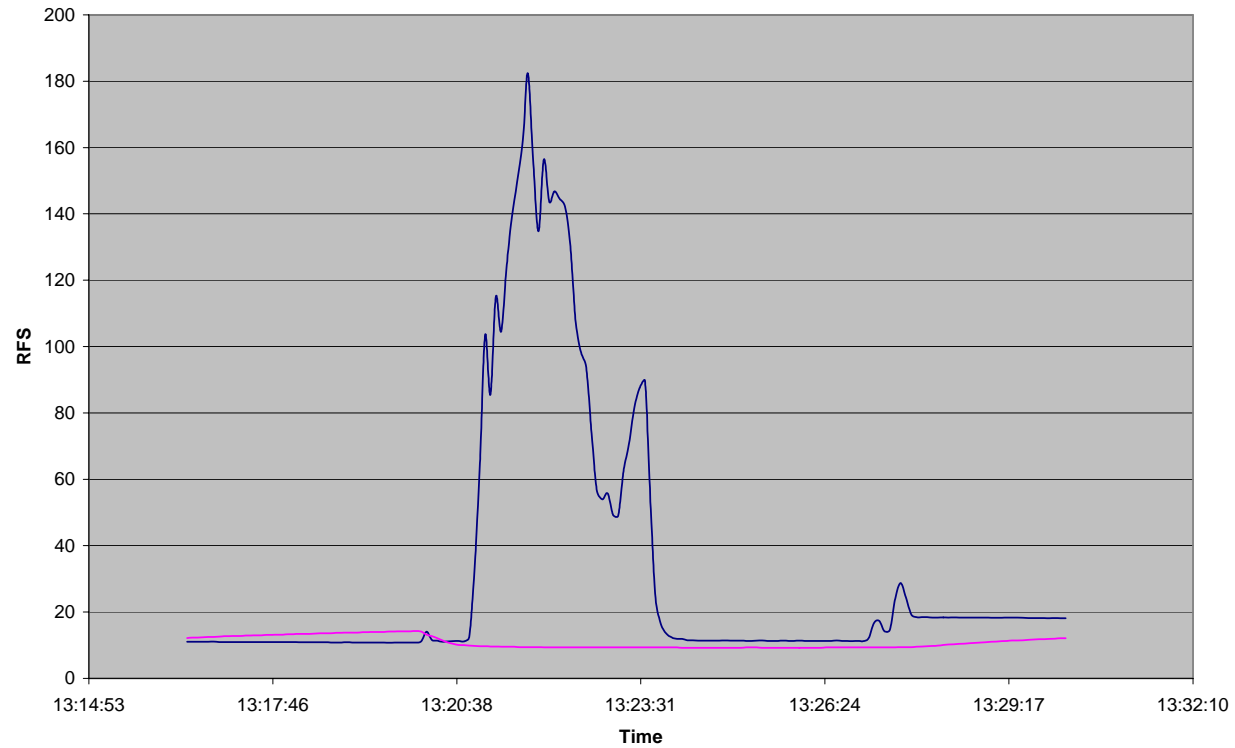




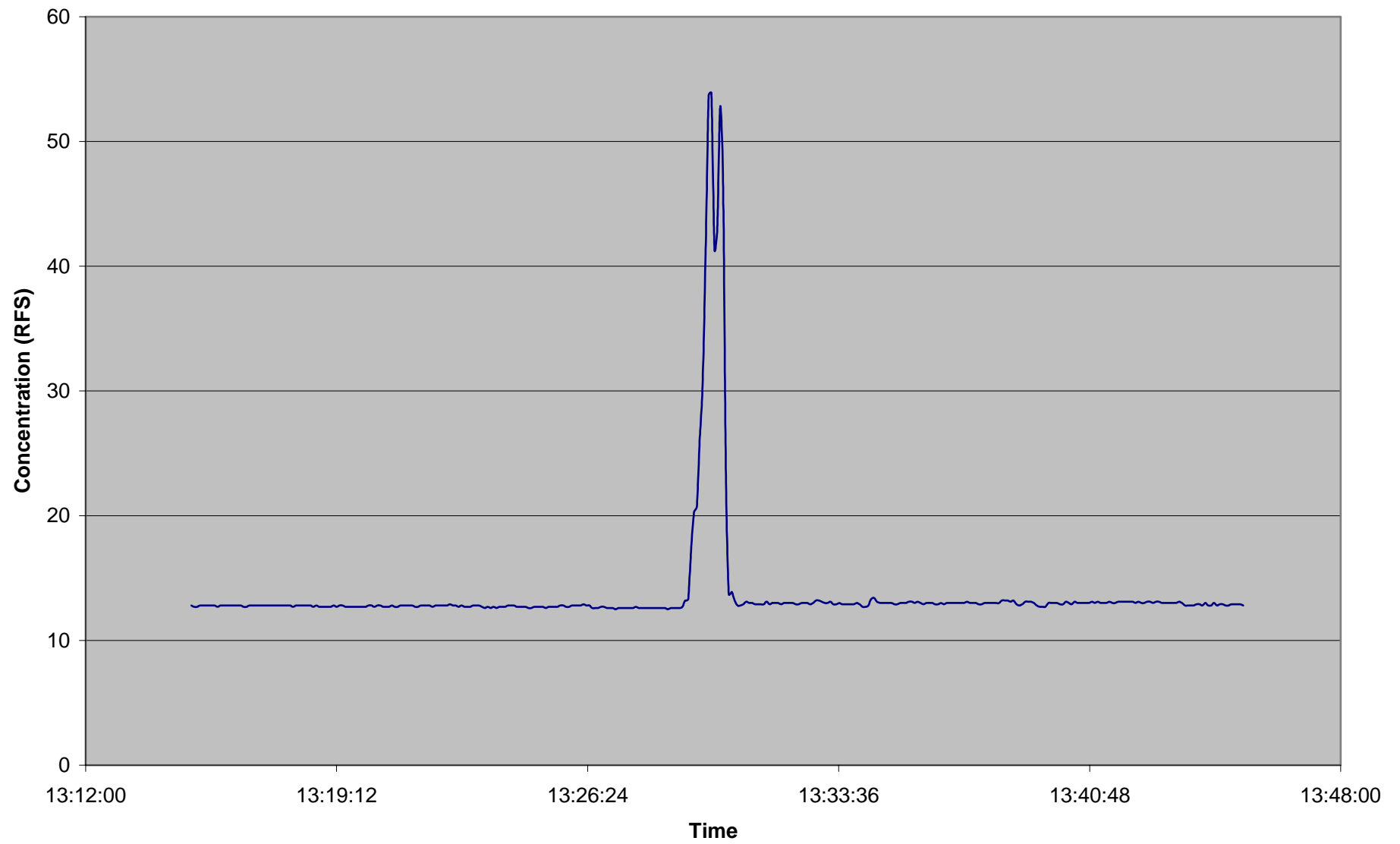
Munson PM Transects

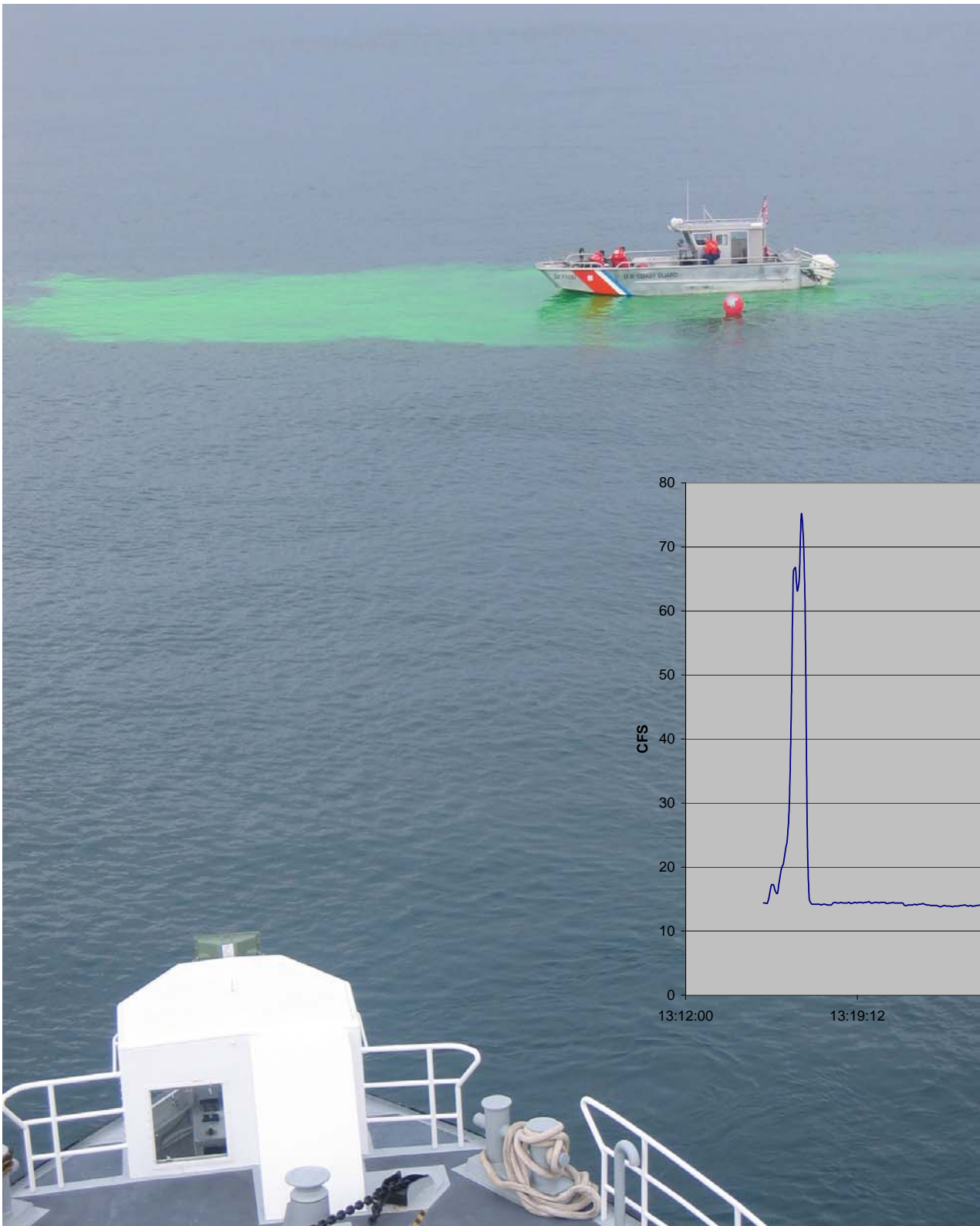


Concentration and Temp vs. Time Artic Tern PM

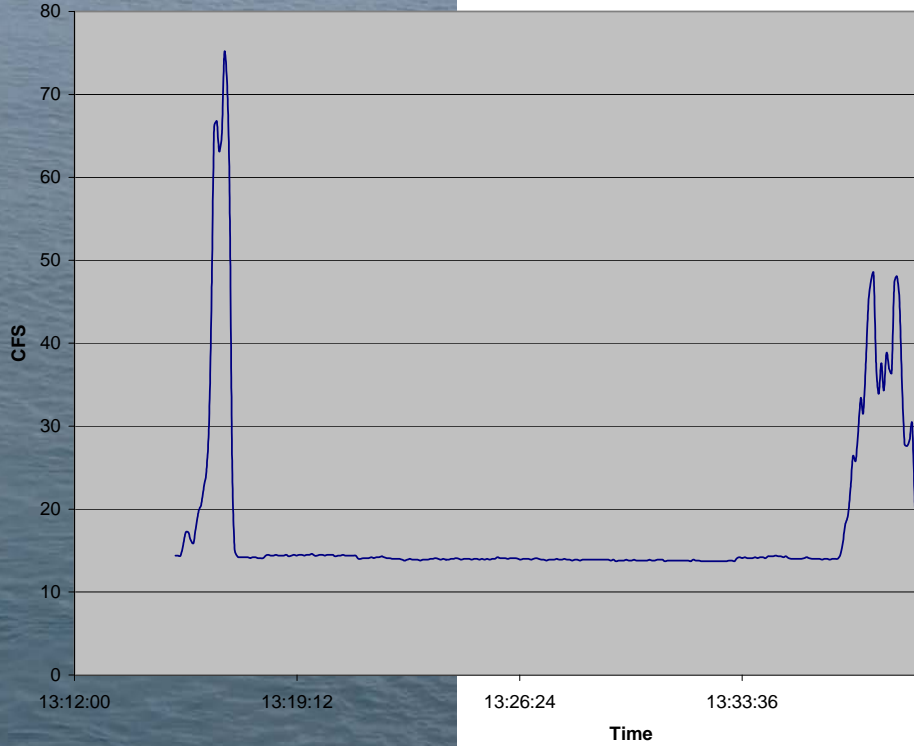


CSCI PM Transect



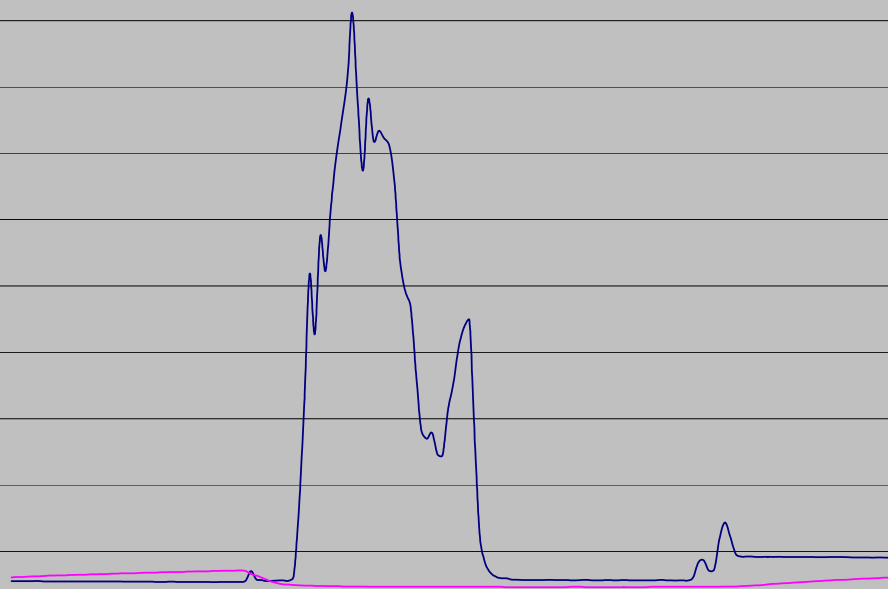


Munson PM Transects



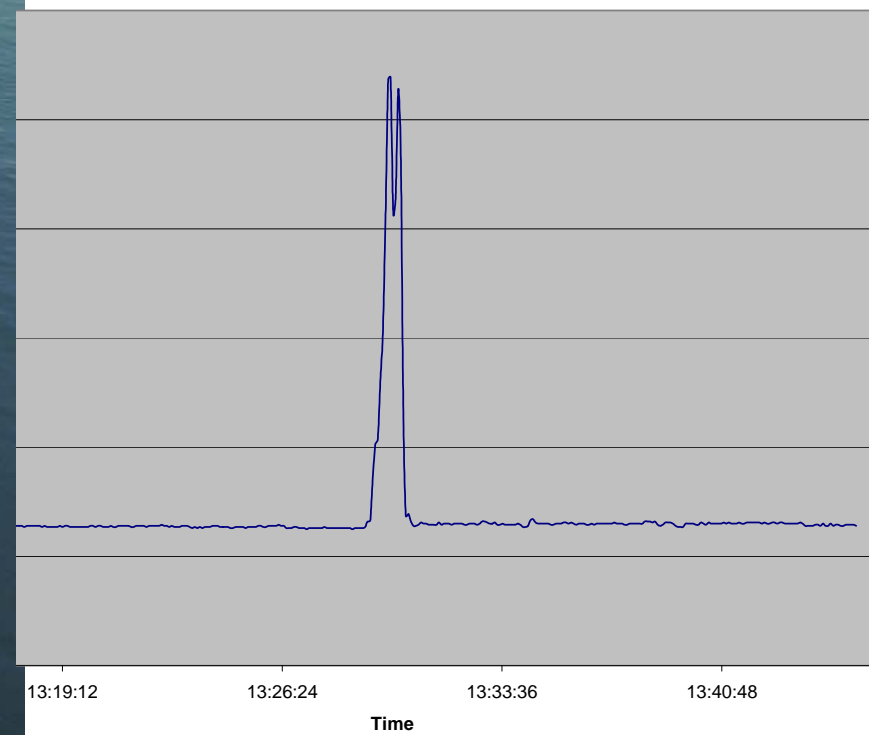


Concentration and Temp vs. Time Arctic Tern PM

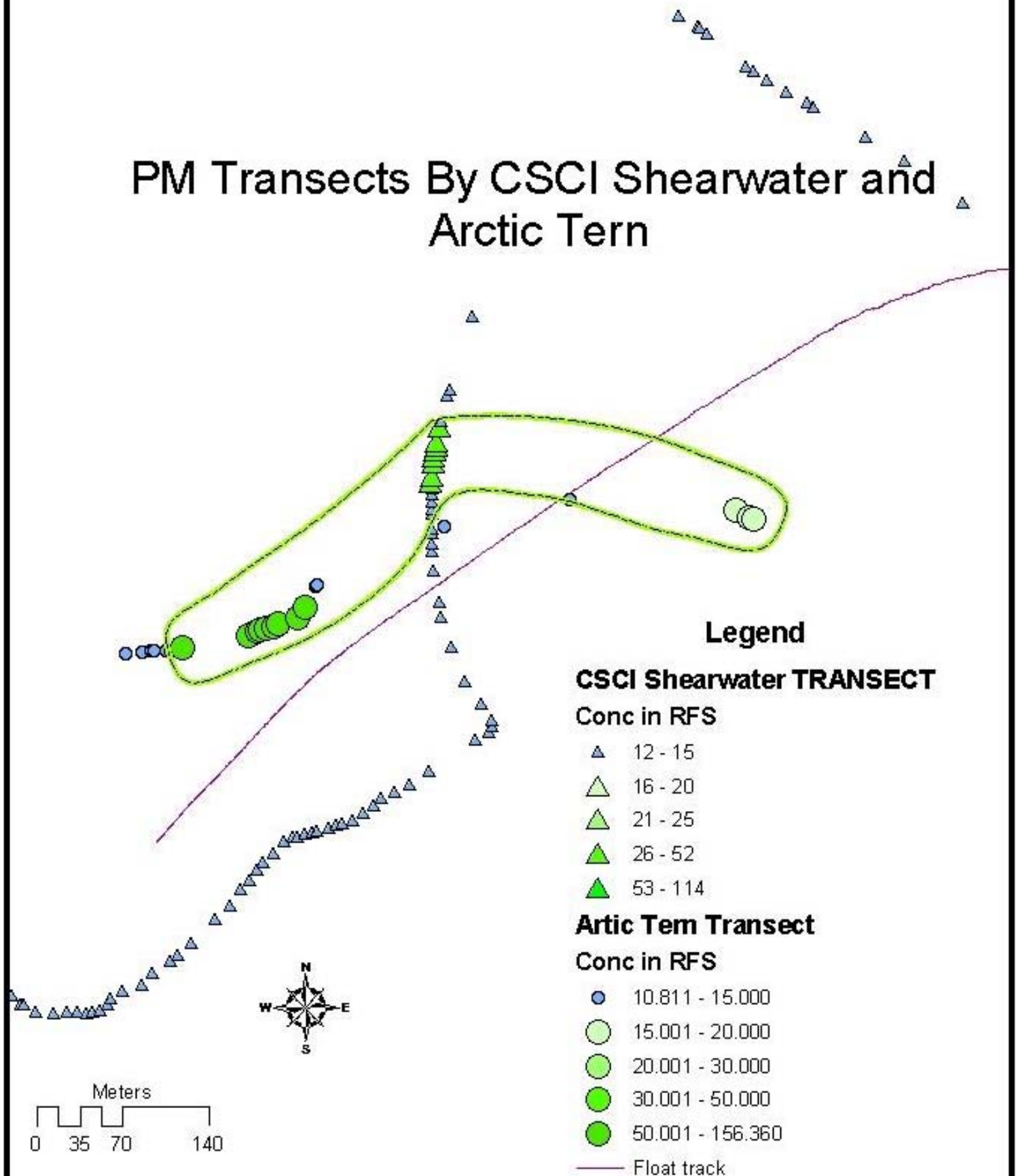


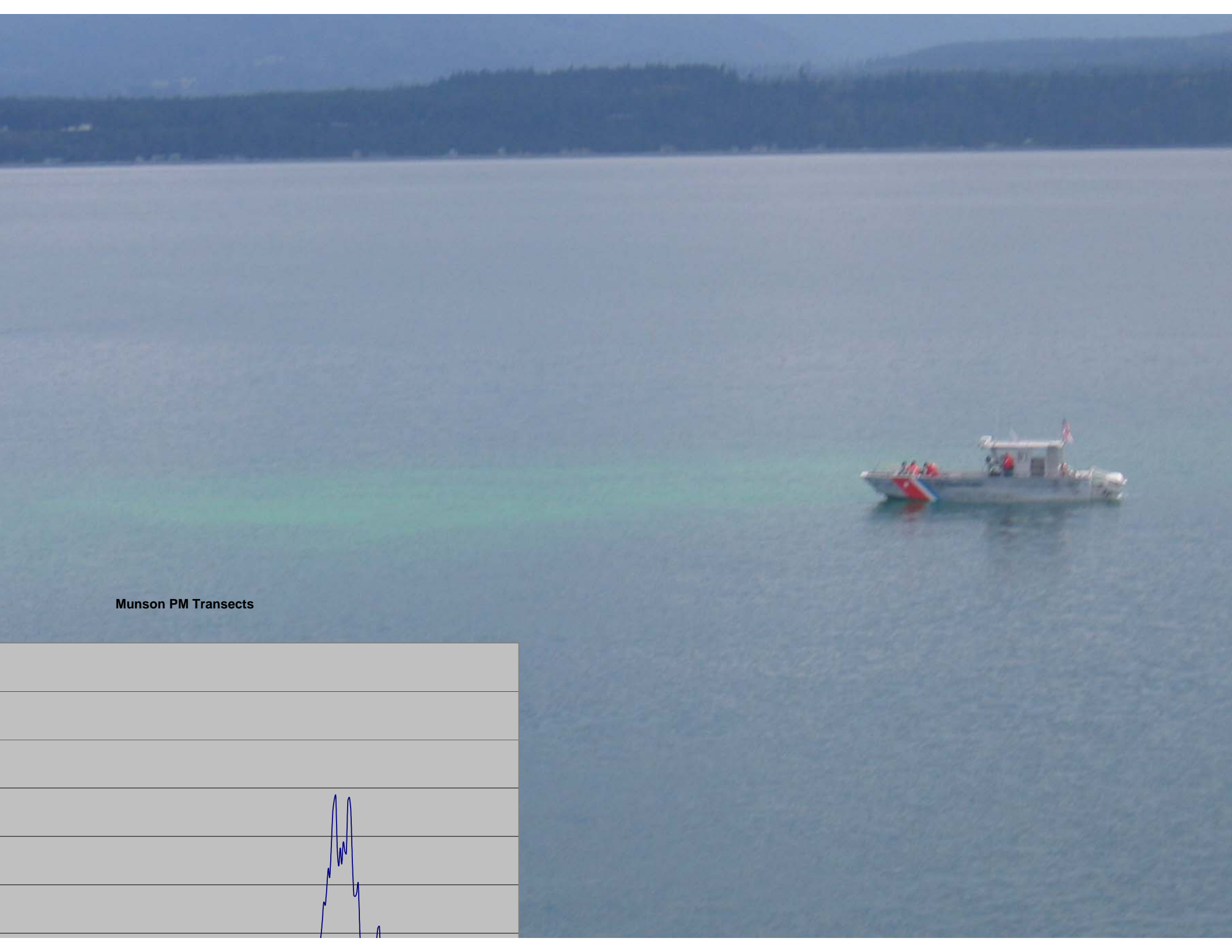


CSCI PM Transect



PM Transects By CSCI Shearwater and Arctic Tern





Munson PM Transects

